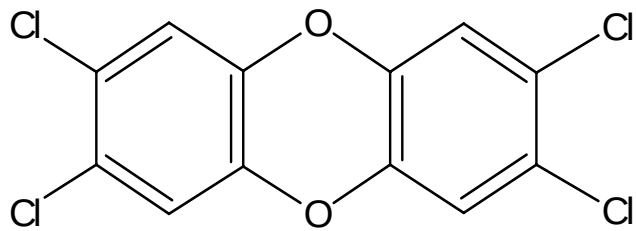
DIOXIN HEALTH STUDIES

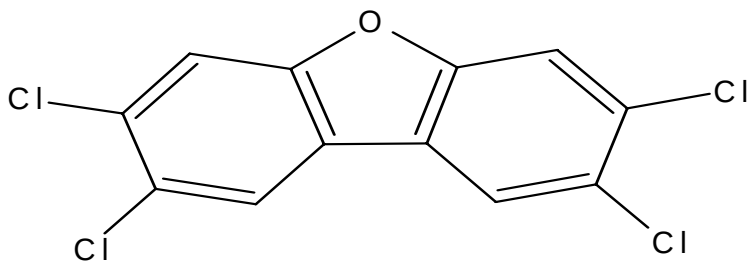
Myrto Petreas
Hazardous Materials Laboratory
Department of Toxic Substances Control, Berkeley, CA

Target Chemicals-POPs

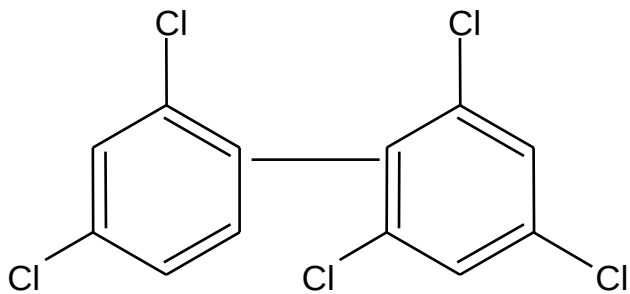
- Chlorinated Dibenzo-p-Dioxins (PCDDs)



- Chlorinated Dibenzo-Furans (PCDFs)



- PCBs
  - TEQ



POP Properties

- Dioxins/Furans inadvertently formed
- PCBs no longer produced, unknown volumes remain

- Persistent
- Lipophilic, bioconcentrate in food web
- Various degrees of toxicity

Epidemiologic Studies

1. Occupational exposures (chemical manufacturing and processing workers, herbicide applicators)
2. Case-control studies in general populations
3. Vietnam veterans with potential exposure to Agent Orange
4. Residents of Seveso, Italy, exposed to TCDD during an accidental explosion of a phenoxy herbicide factory
5. Contaminated rice oil poisonings

Carcinogenicity

- IARC: TCDD is a Human Carcinogen
- USEPA: TCDD is a Human Carcinogen. More data are needed for other congeners.

“In conclusion, although there are uncertainties associated with the epidemiologic evidence that could have influenced the risk estimates rendering these data “limited,” the overall weight of evidence from the epidemiologic studies suggests that **the generally increased risk of overall cancer is more likely than not due to exposure to TCDD and its congeners**. The consistency of this finding in the four major cohort studies and the Seveso victims is corroborated by animal studies that show **TCDD to be a multisite, multisex, and multispecies carcinogen with a mechanistic basis**.”

USEPA, Dioxin Reassessment, 2001

Non-Cancer Effects

- Developmental Neurobehavioral Effects
- Immunological effects
- Dermatologic Disorders-Chloracne
- Liver enzymes, Vitamin A metabolism
- Hormonal effects
  - Thyroid Function
  - Diabetes
  - Endometriosis
  - Sex ratio

Dioxins in SF Bay Area Populations

- Limited data
- It’s all we have….

Populations Examined

- Adipose from:
  - 52 Cancer-free women (28-61 yr), SF Bay Area, Breast Cancer Study Controls, 1996-98, upper/middle SES, 90% Caucasian

- Milk from:
  - 40 First-time mothers (16-35 yr), Stockton, 1998, WIC Clinic, lower SES, 8% Caucasian

Breast Cancer Study Controls

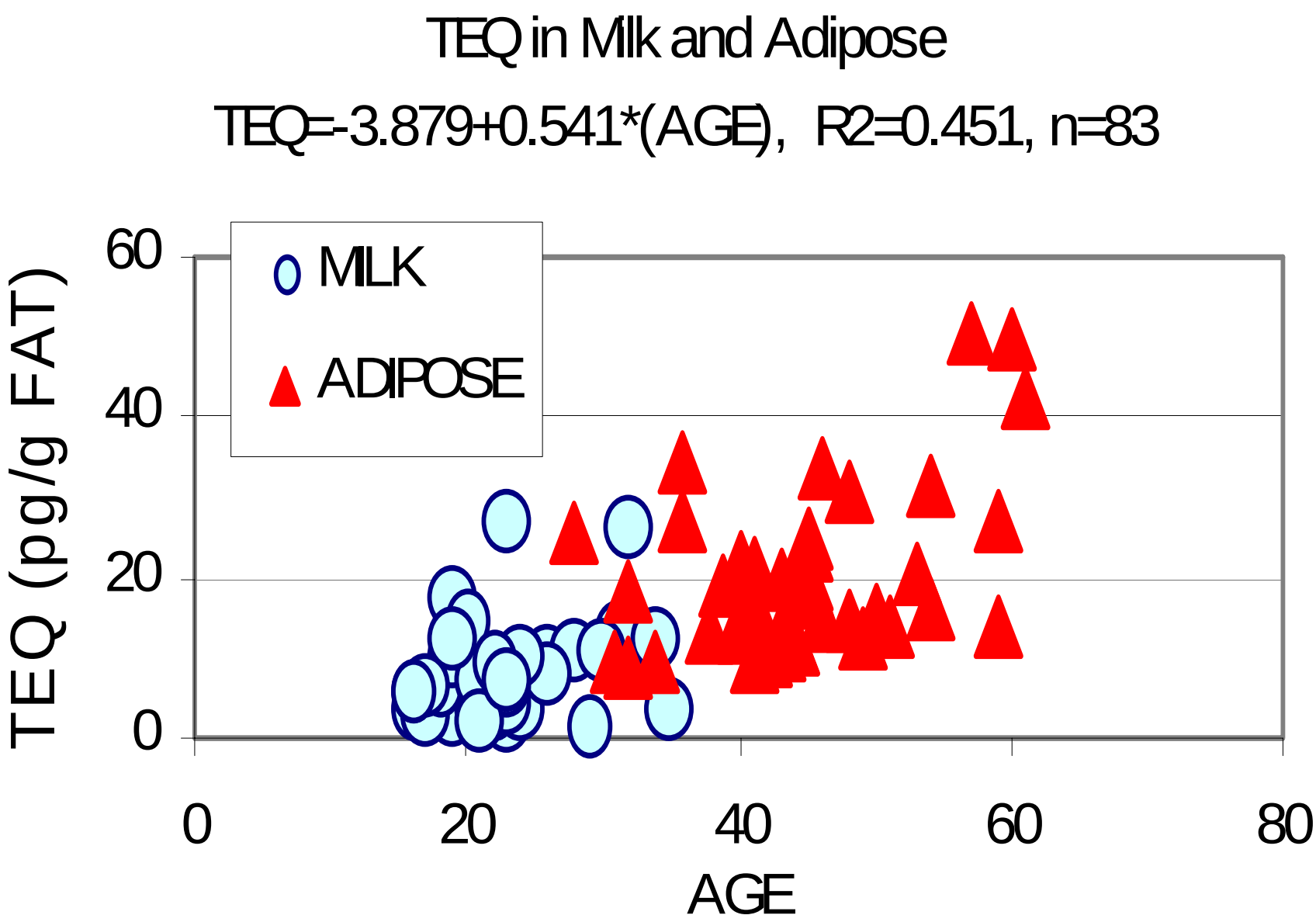
- Females, aged 25-65, undergoing biopsy or lumpectomy at Stanford or Kaiser-Oakland

- 100 Cases, 100 Controls recruited late ’90s
  Controls: Benign breast disease

California EPA, 2001

Milk Study Participants

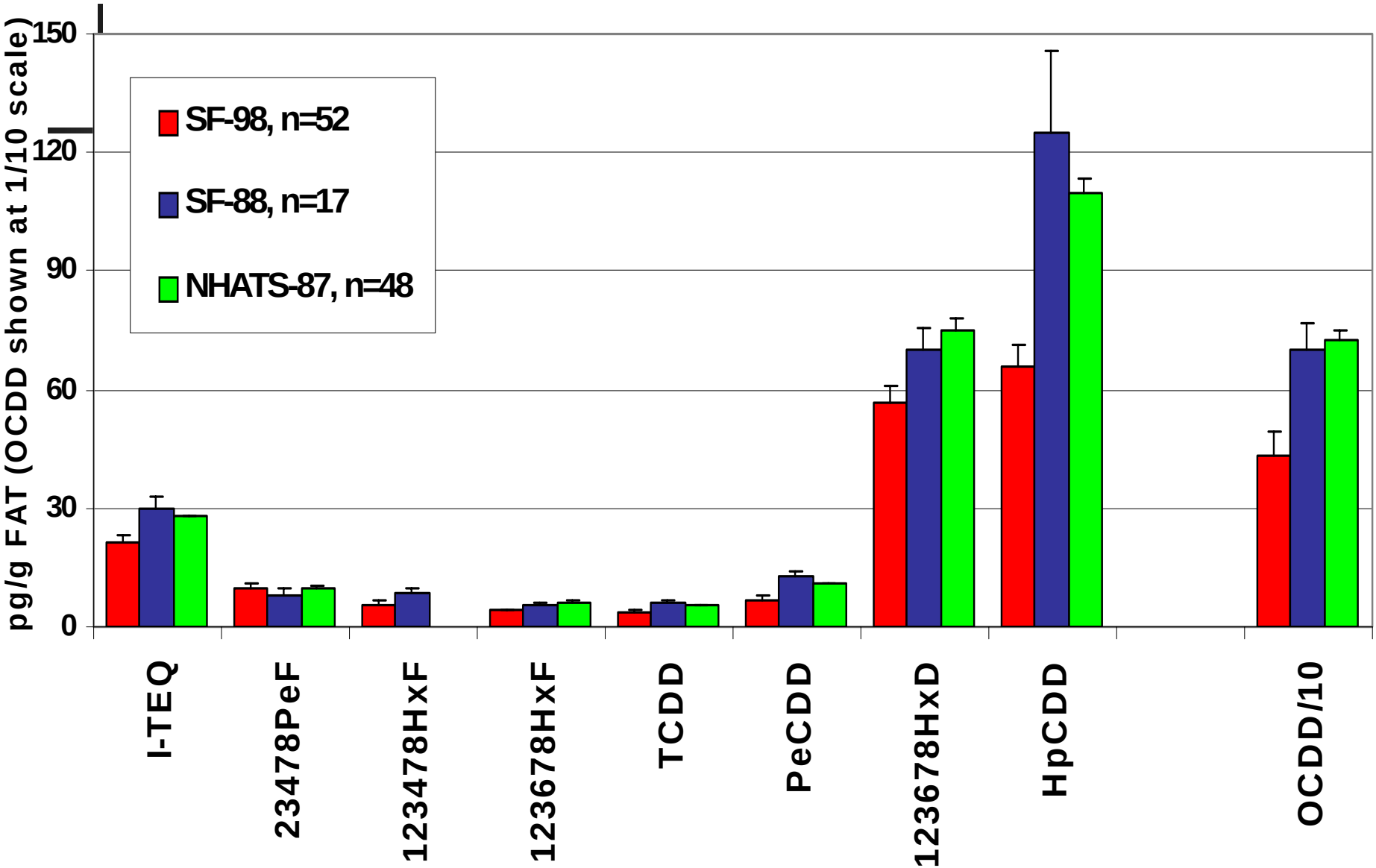
- Prenatally enrolled in WIC program late ’90s
- Resident of Stockton area for 5 yrs or more
- WHO Protocol:
  - Lactating for the first time
  - Infant between 2 and 8 weeks old
  - Both mother and infant in good health


TEQ in Milk and Adipose
TEQ=-3.879+0.541*(AGE), R2=0.451, n=83
MILK
ADIPOSE
TEQ (pg/g FAT)
60
40
20
0
0
20
40
60
80
AGE

Dioxins: Comparison Populations

- NHATS-87
  - Adipose from US survey (surgical patients, cadavers)
    - Use US average for comparison (n=48 composites)
- SF-88
  - Adipose from surgical patients (non-cancer) from SF, LA
    - Use adult female patients from SF, n=17

Major PCDD/F congeners in adipose tissues from the SF Bay Area in 1998 and 1988, and from NHATS-87



Conclusions

- Statistically significant reduction in all PCDD/Fs (except 23478-PeCDF) over the last decade in SF Bay Area
  - **20-50% decrease**

- Concentration increased with age
- Concentration decreased with parity, lactation

I-TEQ in CA and USA